

Appln. No.: 10/622,164

Amdt. dated: 06/20/05

Reply to Office Action of: 03/18/05

AMENDMENTS TO THE SPECIFICATION

Please amend the following paragraphs as indicated:

[0071] A conductive connection plate 62 electrically connected to the base end portion 54b of the power feeding terminal 54 is provided in the power feeding terminal fixing portion 56, and this connection plate 62 is electrically connected to one connection terminal 64a of a circuit breaker 64 received in a rectangular hole 63 provided in the supporting plate 45 in accordance with a soldering. Another connection terminal 64b of the circuit breaker 64 is electrically connected to a conductive branch plate 65 arranged on the supporting plate 45 in accordance with a soldering, and a ~~choekchoke~~ coil 66 is electrically connected to the branch plate.

[0072] The ~~choekchoke~~ coil 66 corresponding to a noise preventing element has a winding wire portion 66b wound around an insulative core member 66a, and a pair of leg portions 66c and 66d corresponding to lead wires respectively protruding from both ends of the winding wire portion 66b, and the winding wire portion 66b is received in a ~~choekchoke~~ coil receiving portion 67 formed in a side of the gear housing 24 of the supporting plate 45, that is, a side of the reduction gear 13 so as to make an axial direction thereof parallel to the armature shaft 18. This ~~choekchoke~~ coil receiving portion 67 is provided at a position deflected to a side of the side surface portion 44 of the end portion 42, in the same manner as that of the screw member 53. Accordingly, the ~~choekchoke~~ coil 66 is arranged so as to be lapped over the screw member 53 in the axial direction of the armature shaft 18, that is, on an extension of the screw member 53 in the side of the gear housing 24. At this time, an axis of the ~~choekchoke~~ coil 66 is slightly displaced from an axis of the screw member 53, however, is not arranged side by side with respect to the screw member 53. That is, the ~~choekchoke~~ coil 66 is arranged in an overlapping manner so as to make the end portion of the screw member 53 in one side in the axial direction, that is, the side

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of the gear housing 24 oppose to the end portion of the winding wire portion 66b in the side of the motor housing 14.

[0073] One leg portion 66c of the ~~chockchoke~~ coil 66 reaches another end portion 41 from the winding wire portion 66b along a guide wall portion 68 provided in the side wall portion 44, and a leading end portion protrudes to the side of the motor housing 14 from the side of the gear housing 24 of the supporting plate 45 via a through hole (not shown) provided in the end portion 42 so as to be electrically connected to the branch plate 65 in accordance with a soldering. That is, the leg portion 66c extends from one end portion 42 of the supporting plate 45 toward another end portion 41, and forms a crossover between the winding wire portion 65b and the branch plate 65 so as to electrically connect the winding wire portion 66b to the branch plate 65. Further, another leg portion 66d of the ~~chockchoke~~ coil 66 protrudes to the side of the motor housing 14 from the side of the gear housing 24 of the supporting plate 45 via a through hole (not shown) provided in the end portion 42, and is electrically connected to a connection plate 70 provided between the end portion 42 of the supporting plate 45 and the side surface portion 44 in the side of the end portion 42 in accordance with a soldering.

[0074] Accordingly, in this sunroof motor 11, since the ~~chockchoke~~ coil 66 provided in the power supply circuit 61 is arranged so as to be lapped over the screw member 53 arranged in parallel to the armature shaft 18 and fixing the leaf spring brush 51 to the brush holder 40 in the axial direction of the armature shaft 18, it is possible to reduce the space for placing the ~~chockchoke~~ coil 66 and it is possible to make the sunroof motor 11 compact.

[0075] Further, since the supporting plate 45 constructing the brush holder 40 is formed in the oval (oblong) shape having a pair of end portions 41 and 42 and the side surface portions 43 and 44, one end leg portion 66c of the ~~chockchoke~~ coil 66 is electrically connected to the power supply circuit 61 in one end portion 41, and another leg portion 66d is connected to the power supply circuit 61 in another end

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portion 42, it is not necessary to provide with the wiring member for introducing the power supply circuit 61 from one end portion 41 to another end portion 42, and it is possible to reduce the number of the parts of the sunroof motor 11 so as to reduce the manufacturing cost.

[0076] Further, since the ~~choekchoke~~ coil 66 is received in the ~~choekchoke~~ coil receiving portion 67 provided in the supporting plate 45, and the leg portion 66c of the ~~choekchoke~~ coil 66 reaching from one end portion 42 to another end portion 41 is arranged along the guide wall portion 68 provided in the side surface portion 44 so as to be formed as the crossover, it is possible to electrically wire between the end portions 41 and 42 without arranging the member in the side surface portions 43 and 44 of the oval brush holder 40, and it is possible to protect the ~~choekchoke~~ coil 66 from the other members or the like so as to improve a reliability of the sunroof motor 11.

[0077] The connection plate 70 is fixed to the end portion 42 of the supporting plate 45 together with the leaf spring member 51a by the screw member 53, and is set in a state of being electrically connected to the leaf spring member 51a. Accordingly, the power feeding terminal 54 is electrically connected to the leaf spring brush 51 via the connection plate 62, the circuit breaker 64, the branch plate 65, the ~~choekchoke~~ coil 66 and the connection plate 70 constituting the power supply circuit 61.

[0078] On the other hand, in the same manner as that of the connection plate 70, a connection plate 71 is fixed to the end portion 41 of the supporting plate 45 together with the leaf spring member 50a by the screw member 52, and one leg portion 72c of a ~~choekchoke~~ coil 72 having a winding wire portion 72b and a pair of leg portions 72c and 72d is electrically connected to the connection plate 70 in the same manner as that of the ~~choekchoke~~ coil 66 in accordance with a soldering. The ~~choekchoke~~ coil 72 is received in a ~~choekchoke~~ coil receiving portion 73 formed at a position deflected to a side of the side surface portion 43 in the side of the gear housing 24 of the end portion 42 of the supporting plate 45 so as to make an axial

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direction of the winding wire portion 72b parallel to the armature shaft 18. Further, one leg portion 72c of the chockchoke coil 72 reaches another end portion 41 from one end portion 42 provided with the winding wire portion 72b along a guide wall portion 74 provided in the side surface portion 43, a leading end portion thereof protrudes to the side of the motor housing 14 from the side of the gear housing 24 of the supporting plate 45 via a through hole (not shown) provided in the end portion 41 so as to be electrically connected to the connection plate 71 in accordance with a soldering. That is, the leg portion 72c extends from one end portion 42 of the supporting plate 45 toward another end portion 41, and forms a crossover between the winding wire portion 72b and the connection plate 71 so as to electrically connect the winding wire portion 72b to the connection plate 71. Further, another leg portion 72d of the chockchoke coil 72 protrudes to the side of the motor housing 14 from the side of the gear housing 24 of the supporting plate 45 via a through hole (not shown) provided in the end portion 42.

[0081] Accordingly, in this sunroof motor 11, since the flat stay main body portion 75c passing through the side of the motor housing 14 in the leaf spring brush 50 is bent at 90 degrees with respect to the supporting plate 45 so as to be along the inner surface of the outer peripheral wall 46a in the case 46, the stay main body portion 75c is hard to be exposed to the noise discharged from the slidable contact portion between the commutator 23 and the brush portion 50b, so that it is possible to reduce the noise generated in the sunroof motor 11. Further, it is possible to reduce the space for placing the stay main body portion 75c. Further, since it is possible to secure a working space at a time of connecting the connection plate 71 to the leg portion 72c of the chockchoke coil 72 in accordance with the soldering, it is possible to improve an assembling property of the sunroof motor 11.

[0082] Further, it is possible to improve a freedom of arranging each of the members such as the power feeding terminal 55, the leaf spring brush 50, the chockchoke coil 72 and the like, by connecting each of the members constituting the

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power supply circuit 61 provided in both end portions 41 and 42 in a divisional manner to each other via the connection stay 75.

[0083] The branch side connection portion 75b is arranged so as to be lapped over the choekchoke coil receiving portion 73 in the end portion 42 of the supporting plate 45 in the axial direction of the armature shaft 18, and the leg portion 72d of the choekchoke coil 72 protrudes from the winding wire portion 72b in the axial direction so as to be electrically connected to the branch side connection portion 75b in accordance with a soldering. On the other hand, the power feeding side connection portion 75a is electrically connected to the base end portion 55b of the power feeding terminal 55. Accordingly, the leaf spring brush 50 is electrically connected to the power feeding terminal 55 via the connection plate 71, the choekchoke coil 72 and the connection stay 75 constituting the power supply circuit 61.

[0090] A condenser holder portion 90 adjacent to the circuit breaker 64 and a condenser holder portion 91 arranged between the choekchoke coil receiving portion 73 and the through hole 47 are provided on the end surface 44 of the supporting plate 45 in the side of the gear housing 24. A main body portion 92a of a condenser 92 corresponding to a noise prevention element having the same structure as that of the condenser 60 mentioned above is received in the condenser holder portion 90, and each of a pair of lead wires 92b and 92c protruding from the main body portion 92a protrudes to the side of the motor housing 14 of the supporting plate 45 via a through hole 93 provided in the supporting plate 45.

[0095] Further, since the extension portion 83a is bent at 90 degrees with respect to the supporting plate 45 so as to be arranged along the inner surface of the outer peripheral wall 46a of the case 46, the extension portion 83a is hard to receive the noise discharged from the slideable contact portion between the commutator 23 and the brush portions 50b and 51b, and it is possible to reduce the noise generated in the sunroof motor 11. Further, it is possible to reduce the space for placing the

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extension portion 83a. Further, since it is possible to secure a working space required at a time of bonding the connection plate 70 to the leg portion 66d of the chockchoke coil 66 in accordance with a soldering, it is possible to make the assembling work of the sunroof motor 11 easy.

[0099] First, when a sunroof opening and closing switch (not shown) is turned on in an opening side in the case that the roof panel 8 is in a fully closed state, a direct current is supplied to each of the power feeding terminals 54 and 55 from the battery via the female connector. At this time, the power feeding terminal 54 is set to a plus side, the power feeding terminal 55 is set to a minus side, and the direct current flows through the power supply circuit 61 from the power feeding terminal 54 toward the power feeding terminal 55. Accordingly, the current supplied to the power feeding terminal 54 is supplied to the commutator 23 via the connection plate 62, the circuit breaker 64, the branch plate 65, the chockchoke coil 66, the connection plate 70 and the leaf spring brush 51, and is rectified in the commutator 23 so as to be supplied to each of the armature coils 22. At this time, in the case that the current supplied from the power feeding terminal 54 becomes larger than a predetermined value for any reason, the circuit breaker 64 is driven and the power supply circuit 61 is shut off. The current supplied to the armature coils 22 is transmitted to another leaf spring brush 50 via the commutator 23. Then, the current reaching the leaf spring brush 50 is transmitted to the power feeding terminal 55 via the connection plate 71, the chockchoke coil 72 and the connection stay 75, and grounded via the female connector. Accordingly, when the sunroof switch is turned on in the open side, the current flows through the armature coils 22 positioned within the magnetic field formed by the permanent magnets 15 and 16, the rotation force is generated in the armature 17, and the armature shaft 18 rotates. Further, the rotation of the armature shaft 18 drives the rotation of the driving gear 10 via the worm gear mechanism 32, and the roof panel 8 is opened.

[0100] Next, when the sunroof switch (not shown) is turned on in a closing

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side in the case that the roof panel 8 is in a fully opened state, a direct current in an opposite direction to the direction in the case of turning on in the opening side flows through the power supply circuit 61. That is, the power feeding terminal 55 is set to a plus side, the power feeding terminal 54 is set to a minus side, and the direct current flows through the power supply circuit 61 from the power feeding terminal 55 toward the power feeding terminal 54. Accordingly, the current supplied to the power feeding terminal 55 is supplied to the commutator 23 via the connection stay 75, the choekchoke coil 72, the connection plate 71 and the leaf spring brush 50, and the current in the opposite direction to that of the case that the opening side is turned on is rectified in the commutator 23 so as to be supplied to each of the armature coils 22. Further, the current transmitted to another leaf spring brush 51 via the commutator 23 is transmitted to the power feeding terminal 54 via the connection plate 70, the choekchoke coil 66, the branch plate 65, the circuit breaker 64 and the connection plate 62, and is grounded via the female connector. Accordingly, when the sunroof switch is turned on in the closing side, the current in the opposite direction to the direction in the case that the opening side is turned on flows through the armature coils 22 positioned within the magnetic field formed by the permanent magnets 15 and 16, and the armature shaft 18 rotates in the opposite direction to the direction in the case that the opening side is turned on. Further, the rotation of the armature shaft 18 drives the rotation of the driving gear 10 via the worm gear mechanism 32, and the roof panel 8 is closed.

[0101] In the sunroof motor 11 mentioned above, there is a case that a surge voltage, that is, a noise is generated in the power supply circuit 61 at a time of rectifying by the respective leaf spring brushes 50 and 51 and the commutator 23 on the basis of an influence of inductance of the armature coil 22. Accordingly, in this sunroof motor 11, the structure is made such that the noise is reduced by each of the condensers 60, 92 and 95 and the choekchoke coils 66 and 72. That is, the structure is made such that a noise having a relatively high frequency in the noise generated in

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the power supply circuit 61 is absorbed by the ~~choekchoke~~ coils 66 and 72, and a noise having a relatively low frequency is absorbed by the condensers 60, 92 and 95. Further, when the power feeding terminal 54 is set to the plus side, the noise is absorbed by the condenser 92 provided between the branch plate 65 and the grounding stay 80, and when the power feeding terminal 55 is set to the plus side, the noise is absorbed by the condenser 95 provided between the connection stay 75 and the grounding stay 80.

[0106] Further, in the embodiment mentioned above, the noise prevention element arranged in the axial direction of the screw member 53 in an overlapping manner is constituted by the ~~choekchoke~~ coil 66, however, the structure is not limited to this, for example, the other noise preventing elements such as the condenser or the like may be arranged.